CLAIMS

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is as follows:

1   1. A method for making prioritized recommendations to a customer in the
2   process of filling a market basket for purchase on an Internet commerce site,
3   the method comprising the steps of:
4   generating a matrix of training data;
5   considering preferences based on associative and renewal buying
6   history from the training data; and
7   making a prioritized recommendation of items so as to maximize the
8   likelihood that the customer will add to the market basket those items with
9   higher priorities.

1   2. The method of claim 1, wherein the two preferences are estimated
2   separately from the training data and combined in proper proportions to obtain
3   an overall preference for item not yet in the market basket.

1   3. A method for making prioritized recommendations to a customer in the
2   process of filling a market basket for purchase on an Internet commerce site,
3   the method comprising the steps of:
4   collecting statistics from training data;
5   precomputing model parameters from the collected statistics; and
6   recommending ordering for a given partial market basket based on the
7   precomputed model parameters.

1   4. The method of claim 3, wherein the step of collecting statistics comprises
2   the steps of:

3   (a)   for each item j, obtaining n_j a number of baskets with item j purchased;

4   (b)   for each item j, obtaining n_j' a number of baskets with j being a sole

5   item purchased;

6   (c)   for each pair of items i and j, obtaining a number of market baskets n_{ji}

7   with items j and i purchased together; and

8   (d)   for each pair of items i and j, obtaining a number of market baskets

9   n_{ji}' with items i and j being the only two items purchased.

1   5. The method of claim 4, wherein the step of precomputing model parameters

2   comprises the steps of:

3   (a)   computing $\mathrm{P(renewal)} = \dfrac{\sum_k n_k'}{\sum_k n_k}$;

4   (b)   for each item j, computing $\mathrm{P}(j) = \dfrac{n_j}{\sum_k n_k}$;

5   (c)   for each item j,

6   computing $\mathrm{P(renewal} \mid j) = \dfrac{n_j'}{n_j} + \mathrm{P(renewal)}\left(1 - \dfrac{n_j'}{n_j}\right)$;

7   (d)   for each item j, computing

8           $\mathrm{P'}(j \mid \mathrm{renewal}) = \mathrm{P(renewal} \mid j) \times \dfrac{\mathrm{P}(j)}{\mathrm{P(renewal)}}$;

9   (e)   for each pair of items i and j with $n_{ij} \neq 0$, computing

10
$$P(j \mid i) = \frac{n_{ji}}{\sum\limits_{k} n_{ki}} \; ;$$

11   (f)   for each pair of items i and j with $n_{ij} \neq 0$, computing

12
$$P(\text{renewal} \mid j,i) = \frac{n_{ji}'}{n_{ji}} + P(\text{renewal})\left(1 - \frac{n_{ji}'}{n_{ji}}\right) \; ; \text{ and}$$

13   (g)   for each pair of items i and j with $n_{ij} \neq 0$, computing

14
$$P'(j \mid \text{asso},i) = P(j \mid i) \times \frac{(1 - P(\text{renewal} \mid j,i))}{(1 - P(\text{renewal} \mid i))} \; .$$

1   6. The method of claim 5, wherein given a partial basket $B = \{i_1, i_2, \ldots, i_k\}$

2   and $\overline{B}$ is a complementary set of items not in B, the step of recommending

3   ordering for a given partial market basket comprises the steps of:

4   (a)   if B is empty, sorting items in order of decreasing $P(j \mid \text{renewal})$ and

5   returning this as an item preference ordering;

6   (b)   if B is non-empty, then

7   (i)   computing $P(\text{renewal} \mid B) = \min_{i_k \in B} P(\text{renewal} \mid i_k)$;

8   (ii)   compute a normalization factor $\sum\limits_{k \in \overline{B}} P'(k \mid \text{renewal})$;

9   (iii)   for each item $j \in \overline{B}$, computing

10
$$P(j \mid \text{renewal}) = \frac{P'(j \mid \text{renewal})}{\sum\limits_{k \in \overline{B}} P'(k \mid \text{renewal})} \; ;$$

11   (iv)   computing a normalization factor $\sum_{k \in \overline{\mathbf{B}}} \mathbf{P}'(j \mid \text{asso},\mathbf{B})$;

12   (v)   for each item $j \in \overline{\mathbf{B}}$, computing

13      $\mathbf{P}'(j \mid \text{asso},\mathbf{B}) = \max_{i_k \in \mathbf{B}} \mathbf{P}(j \mid \text{asso},i_k)$;

14   (vi)   for each item $j \in \overline{\mathbf{B}}$, computing

15      $$\mathbf{P}(j \mid \text{asso},\mathbf{B}) = \frac{\mathbf{P}'(j \mid \text{asso},\mathbf{B})}{\sum_{k \in \overline{\mathbf{B}}} \mathbf{P}'(k \mid \text{asso},\mathbf{B})} \; ;$$

16   (vii)   for each item $j \in \overline{\mathbf{B}}$, computing

17      $\mathbf{P}(j|\mathbf{B}) = \mathbf{P}(j \mid \text{asso},\mathbf{B})\mathbf{P}(\text{asso} \mid \mathbf{B}) + \mathbf{P}(j \mid \text{renewal},\mathbf{B})\mathbf{P}(\text{renewal} \mid \mathbf{B})$;

18   and

19   (viii)   sorting items in order of decreasing $\mathbf{P}(j \mid \mathbf{B})$ and returning this

20   as an item preference ordering.

1   7. The method of claim 6, wherein the step of sorting comprises the step of

2   using a final probability obtained for each item, $\mathbf{P}(j \mid \mathbf{B})$, of a customer buying

3   the item to maximize profit by recommendation.

1   8. The method of claim 7, wherein the step of using a final probability of an

2   item to maximize profit comprises the steps of:

3   assigning a profit amount, $\$_j$, to each item;

4   computing $\mathbf{P}(j \mid \mathbf{B})\$_j$ for each item; and

5   ranking recommendations based on the computation of $\mathbf{P}(j \mid \mathbf{B})\$_j$ for

6   each item.